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| (21) International Application Number: PCT/NL97/00659 (22) International Filing Date: 1 December 1997 (01.12.97) (30) Priority Data: 1004656 29 November 1996 (29.11.96) NL (71)(72) Applicant and Inventor: DE VRIES, Hugo [NL/NL]; Ringdijk 430, NL-2983 GS Ridderkerk (NL). (74) Agent: BARTELDS, Erik; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL). | | (81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Dutch).</i> |
| (54) Title: COMBINED TURF <div data-bbox="467 1081 1193 1606" data-label="Image"> </div> (57) Abstract <p>The invention relates to a base layer (1) for a combined synthetic and natural turf comprising a fabric (2), of which at least a part of the weft (4) and/or warp threads (3) is manufactured from a biodegradable material and/or is wholly absent so that the fabric (2) contains apertures, and synthetic turf fibres (7) which are least partially cowoven with the fabric and of which one or both ends form synthetic grass blades. These ends only protrude from the fabric (2) at those locations where the non-degradable warp and weft threads intersect. The base layer (1) is used in combined synthetic and natural turfs comprising a foundation, optionally a first layer of growth substrate and a base layer according to the invention which is provided with a second layer of growth substrate in which grass plants grow. The invention further relates to a method for laying a combined turf using the base layer of the invention.</p> | | |

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COMBINED TURF

The present invention relates to a base layer for a combined synthetic and natural turf, comprising:

a fabric formed by a plurality of mutually substantially parallel warp threads and a plurality of
5 mutually substantially parallel weft threads intersecting the warp threads, said fabric comprising a plurality of apertures, and

a plurality of synthetic grass fibres connected at least partially to the fabric, at least one of the
10 ends of each fibre protruding outside the fabric and forming a synthetic grass blade. Such a base layer is known, for instance from WO-A-9400639.

Up until a number of years ago a large number of sports were practiced on natural turf. Natural turf
15 has the advantage that it is relatively soft and wounds and injuries are thereby seldom caused during falls, sliding tackles and the like. The great drawback of natural turf however is that it can deteriorate significantly in quality due to intensive use and/or
20 weather conditions. What remains is a badly damaged field with large, bare (sand) surfaces which cannot be played on, or only with difficulty, and which have an unattractive appearance.

Synthetic grass surfaces have therefore already
25 existed for a number of years, in particular for hockey, tennis and the like. Synthetic grass surfaces require less maintenance and withstand a more intensive use than natural turfs. However, the drawback of synthetic turf is that the frictional resistance is so high that wounds
30 and/or injuries can be caused in the case of sliding tackles and undesired falls.

Therefore a hybrid turf or combination turf has already been proposed in the above mentioned patent document WO-A-9400639, in which the advantages of both

types of turf are combined. This combination turf is formed by a conventional synthetic grass surface constituting a base layer on which a layer of growth substrate is strewn. Grass seed is sown into this growth
5 substrate, so that the crowns of the grass ly between the synthetic grass fibres and are protected thereby. The synthetic grass is formed by a backing and a great number of upright synthetic grass fibres connected therewith. The synthetic grass fibres are regularly spaced, and may
10 be connected to the backing by tufting or weaving. The backing is perforated, so as to allow water and roots of the natural grass to pass therethrough. As backing a coarse woven material is for instance proposed, wherein apertures are formed between the warp and weft threads.
15 It is further proposed to construct the backing from two layers, an apertured top layer carrying the synthetic fibres and a bottom layer stabilizing the top layer with the fibres and preventing the fibres from becoming unstuck during handling of the synthetic grass. The
20 bottom layer may be made from a biodegradable material, so that this will gradually disappear after the turf has been laid, leaving only the perforated top layer with the synthetic grass fibres.

In this known combination turf the emphasis is
25 mainly on the synthetic grass, and there is relatively little room for growing a robust natural grass turf. Furthermore, the cost of the known combination turf is relatively high.

It is therefore the object of the present
30 invention to provide a combination turf comprising a relatively high percentage of natural grass and which may be constructed and laid for a relatively moderate cost. This is achieved according to the invention by making use for the combined synthetic and natural turf of a base
35 layer as described above, in which the fibre ends forming the synthetic grass blades protrude from the fabric at location where the weft threads and the warp threads intersect. By forming the synthetic grass blades

exclusively at the intersections of the warp and weft threads, and not at those locations where only warp threads or weft threads are present, a base layer is obtained in which there is relatively much room for
5 arranging natural grass. Furthermore, since the synthetic grass fibres protrude from the fabric at the intersections of warp and weft threads, the loads are transmitted to the base layer at those locations where this is strongest. It is preferable to have the synthetic
10 grass fibres woven into the fabric, whereby a very strong connection is formed.

The apertures in the base layer may be formed immediately during manufacture thereof by enlarged spaces between adjacent warp and/or weft threads, but it is also
15 possible to form the apertures only during use of the base layer by decomposition of warp and/or weft threads made from a biodegradable material.

The above described base layer may be arranged between two layers of growth substrate, with grass being
20 sown in the top layer. Due to the apertures, which are present from the start or are created in the course of time by decay or decomposition of the biodegradable threads, the roots of the natural grass plants have the opportunity to grow through the base layer and to become
25 anchored in the bottom layer of growth substrate and possibly also at least partially in the base layer. Optimal rooting hereby becomes possible while the additional strength of the remaining fabric threads and synthetic grass blades is still retained.

30 Alternatively, it is also possible to suffice with one layer of growth substrate which is arranged on the base layer placed on a foundation. The roots can then become anchored in the layer of growth substrate, the foundation and/or the base layer.

35 The base layer according to the invention preferably has a grid pattern. In such a case the base layer consists of a fabric of a plurality of series of non-degradable weft threads and a plurality of series of

biodegradable weft threads alternating with these series, as well as a plurality of series of non-degradable warp threads intersecting the weft threads and a plurality of series of biodegradable warp threads alternating with these series, and the ends of the synthetic grass fibres protrude from the fabric at locations where the series of non-degradable weft threads and non-degradable warp threads intersect. Relatively robust pieces of fabric thus remain at the intersections of the non-degradable weft and warp threads. In the course of time holes will occur at intersections of biodegradable weft and warp threads. The thus resulting coarse-mesh network is held in place by a layer of growth substrate arranged thereon.

The biodegradable material is for instance jute, coconut fibre, sisal or biodegradable polymers. As additional benefit, many biodegradable threads such as jute and the like have the advantage that they retain moisture well. This is of particular importance, certainly in the initial stages of the development of the turf. Both the biodegradable threads and the non-degradable threads can optionally be impregnated or coated with fertilizers.

It is particularly recommended that the artificial grass fibres are monofilament fibres. In contrast to the fibrillated yarns normally used in synthetic grass surfaces, such monofilament fibres look more like grass blades. If desired however, fibrillated yarns or combinations of different types of yarn can also be used in the base layer according to the present invention.

Synthetic grass fibres are of course usually green. It is however possible according to the present invention for at least a part of the synthetic grass fibres to have at least one colour other than green. A pattern, such as the lines of a playing field or a club logo, can hereby be formed in the synthetic grass part of the combined turf. An advertizing message can also be envisaged here. Fibres with a colour other than green

will become particularly clear when the playing field is damaged. Coloured fibres can optionally be used at the location of the pattern which are the same length as the natural grass and planted more densely in the foundation.

5 The pattern is thus also visible when the natural grass is intact. Repeated application of new chalk lines for playing field lines in particular is thus avoided.

In order to promote growth of the natural grass preferably at least part of the fabric of the base layer
10 is impregnated or coated with fertilizers.

For extra strength at least some of the non-degradable threads could be melting threads. During manufacture of the base layer these melting threads can be heated, whereby they fuse together at the
15 intersections of weft and warp threads.

The length of the synthetic grass fibres can be chosen as desired and depends for instance on the distance over which the fibre is co-woven with the fabric and on the thickness of the layer of growth substrate
20 arranged on the base layer as well as on the desired length of the protruding synthetic grass blades.

Synthetic grass fibres are per se known. Synthetic grass fibres are made for instance from polyolefins, polyamides or fibres of natural or non-
25 natural material. The materials used are preferably resistant to wear under mechanical load and to UV radiation. Synthetic grass fibres are obtainable for instance under the brand names Thiolon™, Trofil™ etc.

The invention also relates to a combined
30 synthetic and natural turf comprising a foundation, a base layer as described above arranged thereon and a layer of growth substrate in which grass plants grow arranged on the base layer. The thickness of the layer of growth substrate arranged on the base layer is preferably
35 chosen such that synthetic grass blades of the base layer remain protruding thereabove. However, in order to achieve the advantages of natural grass it is recommended that the natural grass blades be longer than the

synthetic grass blades. These latter then only appear when the natural grass has wholly or partially disappeared due to use or poor weather conditions. In this way the turf will still retain a green appearance, in any case from a distance. In addition, the fibres give the top layer extra stability and protection, whereby intensity of use can be increased.

Also between the foundation and the base layer may be arranged a layer of growth substrate, in which the roots of the grass plants may become anchored.

The foundation can be any foundation used for natural grass or synthetic grass surfaces, such as soil, sand, or a substructure, foundation etc. If desired, shock-absorbing means such as layers of rubber can be applied to a substructure or foundation of for instance concrete. A skilled person in the field of natural and/or synthetic grass surfaces is very well capable, without inventive work, of choosing the foundation suitable for a particular situation. In this application the term "foundation" will be used for any suitable base on which the combined turf according to the invention is used or which forms part of the surface.

The growth substrate can consist for instance of "infertile leaf mould", a mixture of sand and organic material, or of other top layer mixtures applied for natural grass surfaces. Such growth substrates are generally known.

Although a surface manufactured by means of the base layer according to the invention is particularly suitable as sports-field, it can of course also be applied at other locations if desired, for instance in gardens, playgrounds and (recreational) parks, golf courses and the like. Precisely because the turf is in principle a natural grass surface, the applicability thereof is very wide-ranging.

The synthetic grass fibres can be implanted in the base layer according to the invention at a limited density per unit area because the natural grass forms the

larger part of the combination turf. However, greater densities are also possible in determined conditions.

The base layer according to the invention can be supplied for instance on a roll and is therefore
5 simple to use. The base layer can be unrolled onto the desired foundation of growth substrate and cut or trimmed to size. No complex installations are required during laying of the turf for insertion of the synthetic grass blades, because the base layer is prefabricated and
10 already contains the synthetic grass blades.

Manufacture of the base layer can also take place in simple manner on a weaving machine. Co-weaving of the synthetic grass fibres is carried out by gripper machines, bar looms or twin looms. Such techniques are
15 generally known.

The invention further provides a method for laying a combined turf according to the invention, comprising the steps of:

- a. arranging a base layer as described above on
20 a foundation;
- b. arranging a layer of growth substrate and grass seeds sown therein over the base layer, in such manner that the synthetic grass blades rise at least partially above the layer of growth substrate,
- 25 c. causing the grass seed to germinate and raising grass plants, and
- d. mowing the natural grass to a length which is greater than the length of the synthetic grass blades.

In order to provide a good nutrient medium
30 for the roots of the grass plants, prior to arranging the base layer on the foundation a layer of growth substrate may be arranged thereon.

The step of arranging a layer of growth substrate including grass seeds over the base layer may
35 further comprise the intermediate steps of:

- b1. at least partially working or strewing the growth substrate into the base layer,

b2. sowing the grass seed into the growth substrate, and

b3. arranging the remainder of the growth substrate over the grass seed.

5 According to the invention the method may therefore include a number of variants. It is thus possible to place the base layer directly onto the foundation or onto a layer of growth substrate arranged on the foundation. Depending on the chosen option, the
10 grass seed can then be sown directly onto the base layer, in a layer of growth substrate arranged on the base layer or on this layer of growth substrate. If desired, combinations can be applied. It is also possible, if desired, to sow in the foundation or the layer of growth
15 substrate under the base layer. This is not recommended however, because the grass seeds will then usually lie too deep.

 In the present application the terms "grass surface" and "turf" are used interchangeably.

20 The present invention will be further elucidated on the basis of the annexed drawings in which corresponding reference numerals refer to corresponding components and in which:

 figure 1 shows a perspective detail view of a
25 base layer according to the invention with separated parts;

 figure 2 shows a perspective detail view of a base layer according to the invention;

 figure 3 is a partly broken away perspective
30 detail view of a part of a combined turf according to the invention with grass which is just germinating; and

 figure 4 is a partly broken away perspective detail view of a part of a combined turf according to the invention with a number of adult grass plants.

35 Figures 1 and 2 show a base layer 1 consisting of a fabric 2 of series of non-degradable warp threads 3 and weft threads 4 alternating with series of biodegradable warp threads 5 and weft threads 6.

Synthetic grass fibres 7, preferably in a bundle 8, are co-woven such that the ends 9 and 10, which form grass blades, extend from the fabric at intersections 11 of non-degradable warp and weft threads. At each

5 intersection the blades of for instance two successive bundles 8a and 8b extend outward. In an alternative embodiment of the invention the threads 5 and 6 can be omitted, whereby apertures are already created immediately in the fabric.

10 Figure 3 shows a first layer of growth substrate 12 onto which base layer 1 is placed. The foundation or substructure for the whole construction are not shown in detail. In a second layer of growth substrate 13 are sown grass seeds 14, only a few of which
15 are shown for the sake of clarity. In the situation shown, the seeds have just germinated. In figure 4 the grass plants 15 are adult and their roots 16 extend into the lower layer of growth substrate. The natural grass blades 17 are longer than synthetic grass blades 18. In
20 figure 3 the biodegradable threads 5, 6 are still present. In figure 4 they have decomposed or have never been present, thereby resulting in apertures 19.

The base layer according to the invention is simple to manufacture and easy to use. The grass surfaces
25 produced therewith moreover have all the advantages of natural grass and synthetic grass, while the most important drawbacks of both are avoided.

CLAIMS

1. Base layer for a combined synthetic and natural turf, comprising:

5 a fabric formed by a plurality of mutually substantially parallel warp threads and a plurality of mutually substantially parallel weft threads intersecting the warp threads, said fabric comprising a plurality of apertures, and

10 a plurality of synthetic grass fibres connected at least partially to the fabric, at least one of the ends of each fibre protruding outside the fabric and forming a synthetic grass blade, characterized in that the fibre ends forming the synthetic grass blades protrude from the fabric at location where the weft threads and
15 the warp threads intersect.

2. Base layer as claimed in claim 1, characterized in that the synthetic grass fibres are woven into the fabric.

3. Base layer as claimed in claim 1 or 2,
20 characterized in that the apertures are formed by enlarged spaces between adjacent warp and/or weft threads.

4. Base layer as claimed in any one of the preceding claims, characterized in that the apertures are formed during use of the base layer by warp and/or weft
25 threads made from a biodegradable material.

5. Base layer as claimed in claim 4, characterized in that the fabric is formed by a plurality of series of non-biodegradable weft threads and a plurality of series of biodegradable weft threads alternating with
30 these series and a plurality of series of non-biodegradable warp threads intersecting the weft threads and a plurality of series of biodegradable warp threads alternating with these series, and in that the ends of the synthetic grass fibres protrude from the fabric at
35 the intersections of these series of non-biodegradable warp threads and non-biodegradable weft threads.

6. Base layer as claimed in claim 4 or 5, characterized in that the biodegradable material is chosen from jute, sisal, coconut fibre, or biodegradable polymers.

5 7. Base layer as claimed in any one of the preceding claims, characterized in that the artificial grass fibres are monofilament fibres.

8. Base layer as claimed in any one of the preceding claims, characterized in that at least part of
10 the synthetic grass fibres has at least one colour other than green.

9. Base layer as claimed in claim 8, characterized in that the synthetic grass fibres having different colours form a pattern like lines of a sportsfield or a
15 club logo.

10. Base layer as claimed in any one of the preceding claims, characterized in that at least part of the fabric is impregnated or coated with fertilizers.

11. Base layer as claimed in any one of the preceding claims, characterized in that at least part of
20 the non biodegradable threads comprise melting threads.

12. Combined synthetic and natural turf, comprising a foundation, a base layer as claimed in any one of the preceding claims arranged thereon, and a layer of
25 growth substrate in which grass plants may grow arranged on the base layer.

13. Combined turf as claimed in claim 12, characterized in that the thickness of the layer of growth substrate on the base layer is chosen such that
30 the synthetic grass blades of the base layer protrude thereabove.

14. Combined turf as claimed in claim 12 or 13, characterized by a layer of growth substrate arranged between the foundation and the base layer.

15 15. Combined turf as claimed in any one of claims 12 to 14, characterized in that the growth substrate consists of "infertile leaf mould", a mixture of

sand and an organic material, or top layer mixtures applied in natural grass turfs.

16. Combined turf as claimed in any one of claims 12 to 15, **characterized in that** the turf is used as sportsfield or as grass turf in gardens, playgrounds, (recreational) parks or golf courses.

17. Method for creating a combined turf as claimed in any one of claims 12 to 16, comprising the steps of:

10 a. arranging a base layer as claimed in any of of claims 1 to 11 on a foundation;

b. arranging a layer of growth substrate and grass seeds sown therein over the base layer, in such manner that the synthetic grass blades rise at least partially above the layer of growth substrate,

c. causing the grass seed to germinate and raising grass plants, and

d. mowing the natural grass to a length which is greater than the length of the synthetic grass blades.

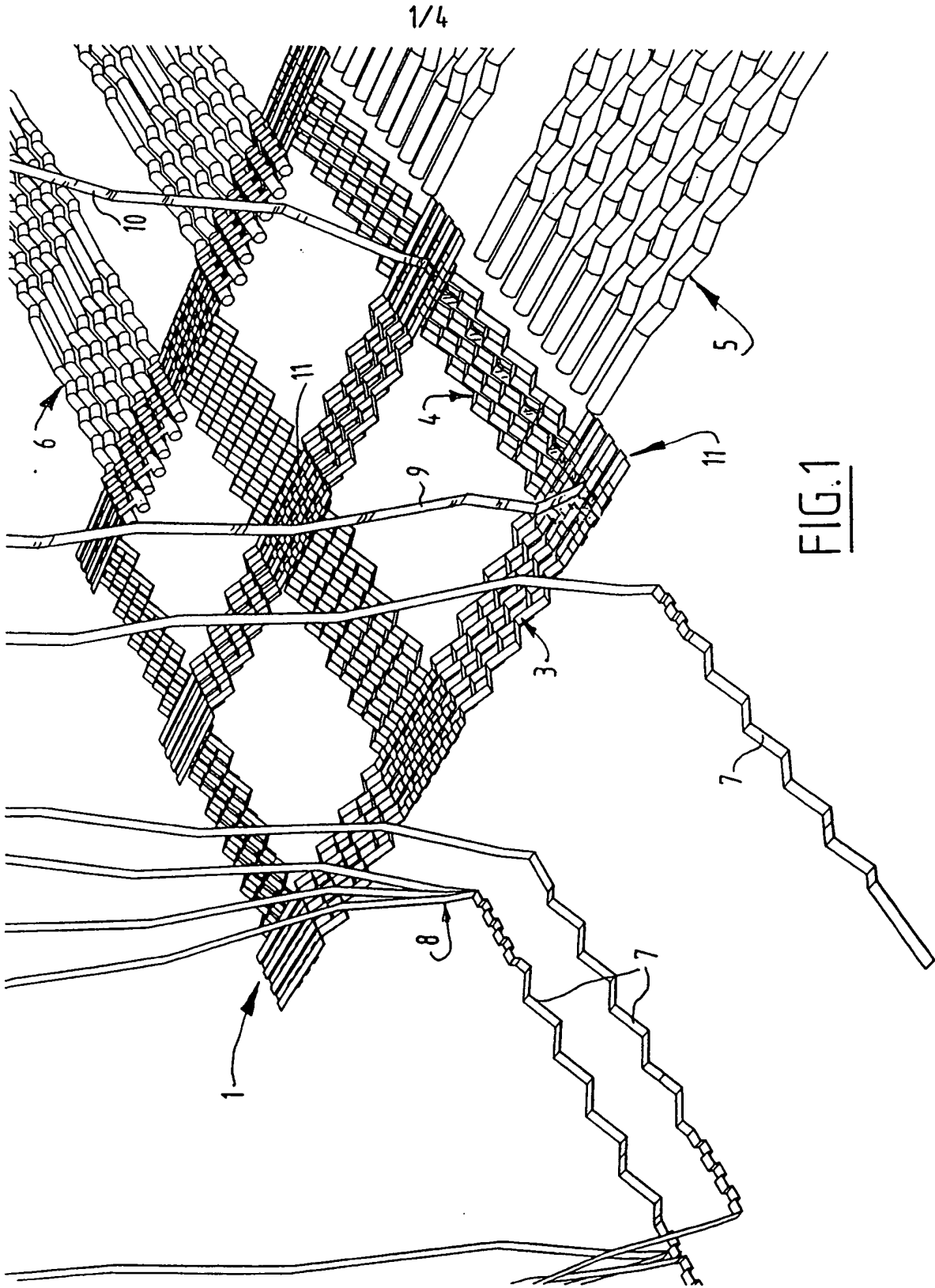
18. Method as claimed in claim 17, **characterized in that** prior to arranging the base layer on the foundation a layer of growth substrate is arranged thereon.

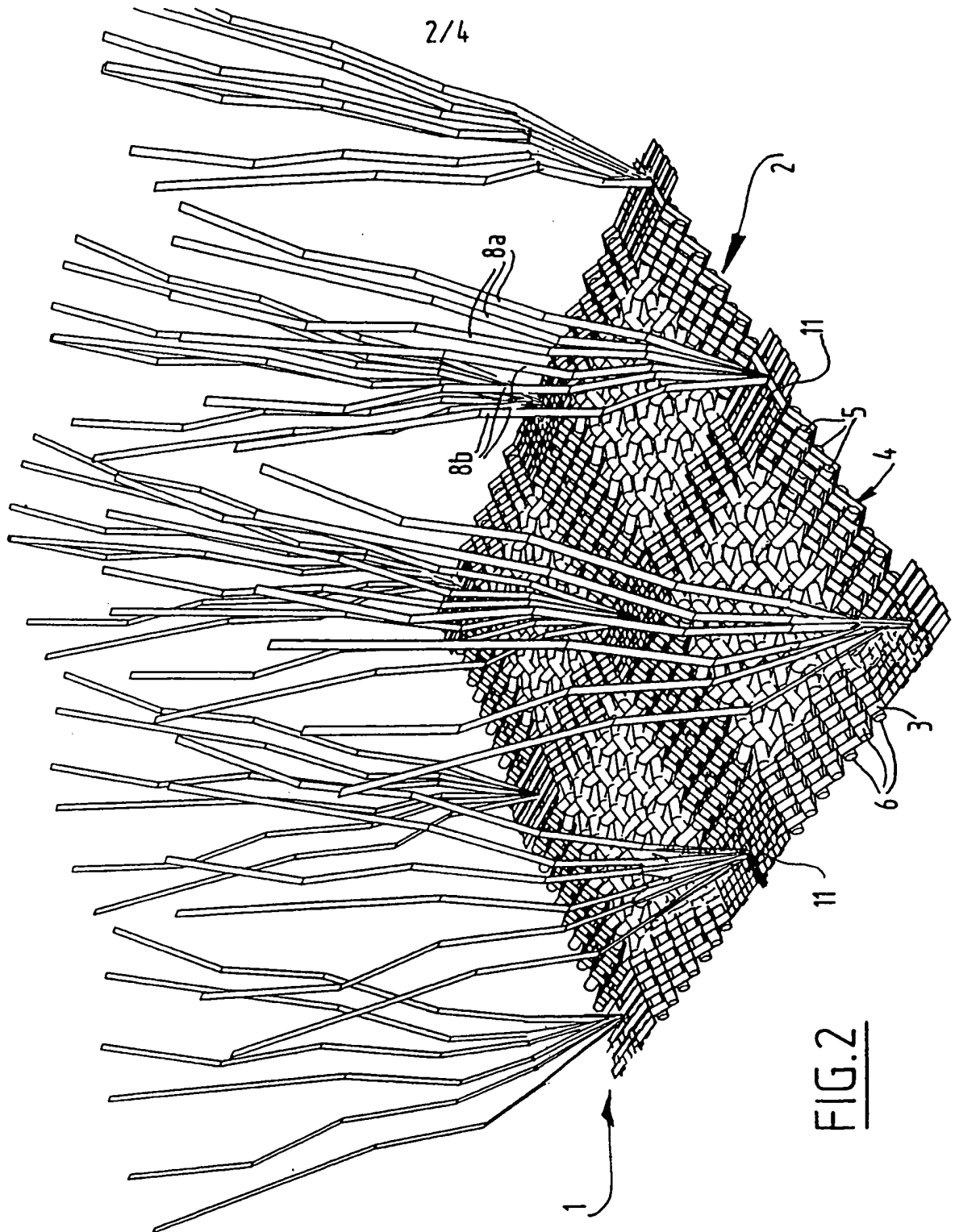
19. Method as claimed in claim 17 or 18, **characterized in that** the step of arranging a layer of growth substrate including grass seeds over the base layer comprises the intermediate steps of:

b1. at least partially working or strewing the growth substrate into the base layer,

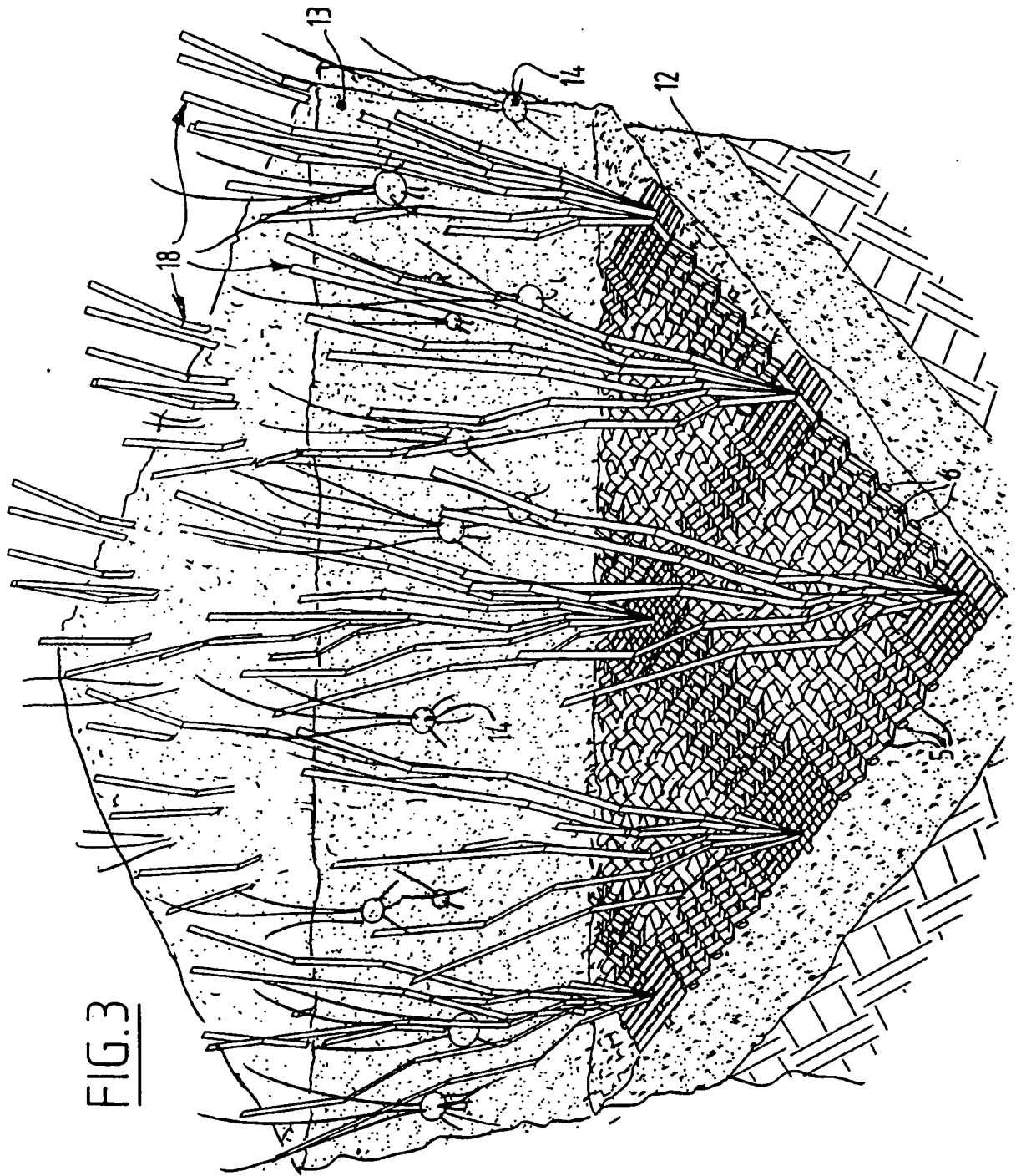
b2. sowing the grass seed into the growth substrate, and

b3. arranging the remainder of the growth substrate over the grass seed.





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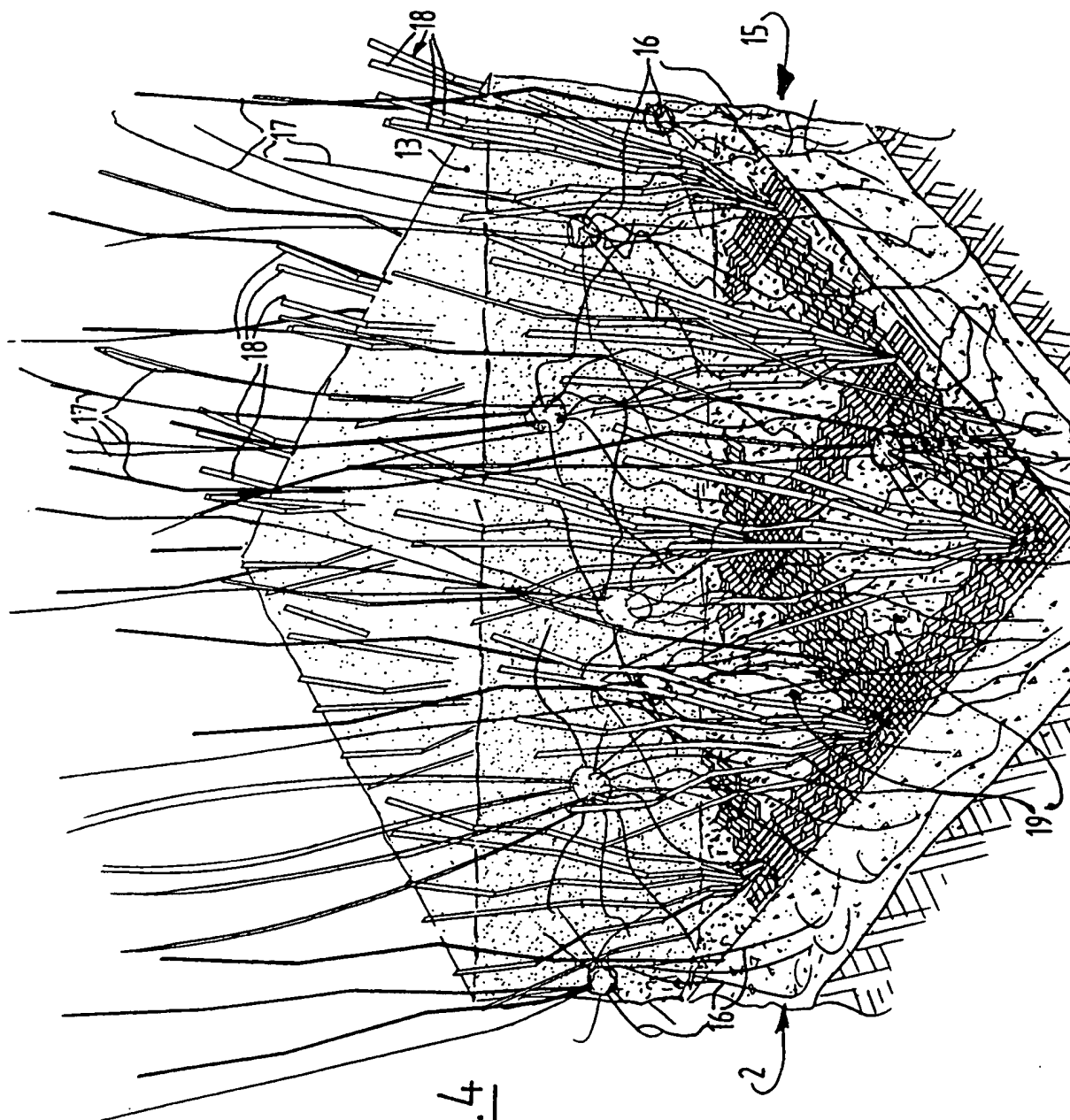


FIG. 4

INTERNATIONAL SEARCH REPORT

Internat. Application No

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E01C13/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 E01C A01G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------------------|
| A | WO 94 00639 A (BERGEVIN JERRY G) 6 January 1994 cited in the application see the whole document --- | 1, 2, 6, 12, 13, 16, 17, 19 |
| A | EP 0 724 825 A (OTSUKA KAGAKU KK ; MAEDAKENSETSU KOGYO KABUSHIKI K (JP)) 7 August 1996 see abstract see column 9, line 35 - line 37 see column 26, line 2 - line 9; figures --- | 1, 3, 8, 10, 12, 17 |
| A | EP 0 403 008 A (HEIDEMIJ UITVOERING) 19 December 1990 see the whole document --- | 1, 3, 6, 12, 17 |
| -/-- | | |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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|------------|--|-----------------------|
| A | <p>US 4 396 653 A (TOMARIN SEYMOUR A) 2 August 1983 see column 3, line 8 - line 37; figures 1,2</p> <p>-----</p> | 1 |

INTERNATIONAL SEARCH REPORT

...formation on patent family members

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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| WO 9400639 A | 06-01-94 | AU 675074 B | 23-01-97 |
| | | AU 4646093 A | 24-01-94 |
| | | CA 2138784 A | 06-01-94 |
| | | EP 0648292 A | 19-04-95 |
| | | JP 7508325 T | 14-09-95 |
| | | US 5586408 A | 24-12-96 |
| | | US 5489317 A | 06-02-96 |
| EP 0724825 A | 07-08-96 | JP 8033406 A | 06-02-96 |
| | | JP 8154488 A | 18-06-96 |
| | | JP 8154489 A | 18-06-96 |
| | | WO 9603027 A | 08-02-96 |
| EP 0403008 A | 19-12-90 | NL 8901484 A | 02-01-91 |
| US 4396653 A | 02-08-83 | CA 1182485 A | 12-02-85 |